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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/816,770	03/26/2001	Tsuyoshi Kitahara	Q63724	4825

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EXAMINER

NGUYEN, LAM S

ART UNIT	PAPER NUMBER
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2853

DATE MAILED: 02/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/816,770	KITAHARA, TSUYOSHI	
	Examiner	Art Unit	
	LAM S NGUYEN	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12 and 20 is/are allowed.
- 6) ☒ Claim(s) 1-11 and 13-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 01/02/2004 . 6) ☐ Other: _____

DETAILED ACTION

Information Disclosure Statement

The reference JP 1158074 listed in the form 1449 filed on 01/02/2004 should be corrected as JP 1158704.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-10, 13-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahara et al. (EP0827838) in view of Barbehenn et al. (U.S. 5363134) and Takahiro et al. (JP 11058704).

Kitahara et al. disclose a method of jetting liquid droplets or a liquid jetting apparatus, comprising:

providing a liquid head (FIG. 1, element 10), including: a plurality of nozzle orifices (FIG. 3, element 22A, and column 6, line 19-22); a plurality of pressure generation chambers associated with the nozzle orifices (FIG. 3, element 27, and column 7, line 38-39); and a plurality of piezoelectric vibrators for respectively varying the volume of the associated pressure generation chamber to jet a liquid droplet from the associated nozzle orifice (FIG. 3, element 17);

Kitahara et al. do not disclose the providing ID data provides the ID data for identifying the respective nozzle orifices.

However, Barbehenn et al. disclose ID data storage provides the ID data for identifying the respective nozzle orifices (column 3, line 43-53).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to include the ID storage (column 3, line 43-53) for providing the ID data of the respective nozzle orifices as disclosed by Barbehenn et al. into the printing apparatus disclosed by Kitahara et al. The motivation of doing so is to increase the capability of controlling the ejecting of proper ink volume, the ink drop velocity, and various other manufacturing tolerances or defects for driving an array of nozzle orifices as taught by Barbehenn et al. (column 2, line 2-8).

In addition, Kitahara et al. and Barbehenn et al. do not disclose the providing a reference drive signal which is applied to the piezoelectric vibrator such that a reference liquid droplet having a designated amount is jetted from the nozzle orifice, applying the reference drive signal to the respective piezoelectric vibrators to jet liquid droplet from the nozzle orifices; measuring amounts of the respective liquid droplets jetted by the reference drive signal, identifying a difference between the designated amount and the measured amount of each liquid droplet; providing correction data for reducing the difference, associating the correction data with the respective nozzle orifices identified by the ID data, storing the associated correction data, and adjusting a displacement behavior of a piezoelectric vibrator associated with the identified nozzle orifice, based on the corrected data drive signal when the identified nozzle orifice receives print data (FIG. 4-7, and column 10, line 20-35) (**Referring to claims 13-19**).

However, Takahiro et al. disclose a process used in an image forming apparatus comprising the steps of providing a reference drive signal to instruct the piezoelectric vibrator to jet a reference liquid droplet having a designated amount from the nozzle orifice (paragraph [0023]: a corresponding drive waveform is given to each ink discharge means to discharge an ink quantity that is setup beforehand), applying the reference drive signal to the respective piezoelectric vibrators to jet liquid droplet from the nozzle orifices, measuring amounts of the respective liquid droplets jetted by the reference drive signal (paragraph [0023]: the drive waveform is applied to the ink discharge means 1-1 to 1-N and the amount of ink ejected out from each nozzle is measured); identifying a difference between the designated amount and the measured amount of each liquid droplet (paragraph [0023]: comparing the reference value of the ink discharge quantity set up beforehand to the measured ink discharge value), providing correction data for reducing the difference so that the designated amount is jetted from the nozzle orifice (paragraph [0023]: an error with the amount of ink ejected from each nozzle is computed and the variation amendment is adjusted so the desired amount of ink is ejected from each nozzle), associating the correction data with the respective nozzle orifices identified by the ID data (paragraph [0023]: the amount of ink ejected is measured and used to compute the error for each nozzle), storing the associated correction data (paragraph [0023]: the variation amendment table is adjusted), and adjusting a displacement behavior of a piezoelectric vibrator associated with the identified nozzle orifice, based on the corrected data (paragraph [0023]: based on the adjusted table, a desired amount of ink is ejected from each nozzle).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to modify the process used in the jetting liquid droplets apparatus

Art Unit: 2853

disclosed by Kitahara et al. in view of Barbehenn et al. such that including the steps of providing the reference drive signal to the actuator to jet a designated amount of liquid, measuring amounts of the jetted liquid droplets, identifying a difference between the designated amount and the measured amount of each liquid droplet, providing correction data for reducing the difference, and adjusting a displacement behavior of the piezoelectric vibrator based on the corrected data as disclosed by Takahiro et al. into The motivation of doing so is to control the variation in the ink discharge quantity from each nozzle in order to obtain a record image without concentration unevenness or banding as taught by Takahiro et al. (paragraph [0024]).

Kitahara et al. also disclose the following claimed invention :

Referring to claims 3, 6, 8:

comprising at least one drive signal generator (FIG.1, element 8), for generating N drive signals (FIG. 9: Four selected signals), respectively driving the piezoelectric vibrators, within a single jetting cycle (FIG. 9: in term of “print period”) (FIG. 4) of the liquid jetting head, N being an integer which is not less than 3 (FIG. 9: $N = 4$);

comprising a drive signal supplier (FIG. 1, element 16) for selecting at least one drive signals or M drive signals (FIG. 9: $M = \text{one or at least two}$) from the plural or N drive signals to adjust a displacement behavior of a piezoelectric vibrator associated with the identified nozzle orifice (FIG. 9: each selected signal adjusts the amount of ink ejected), wherein M being an integer which is equal to or less than N (FIG. 9, $M = 1 \text{ or } 2 < N = 4$);

applying the M drive signals to the piezoelectric vibrators within the single jetting cycle (FIG. 9);

Art Unit: 2853

Referring to claim 2: providing a plurality of drive signals for driving the piezoelectric vibrators to jet liquid droplets from the nozzle orifices, the drive signals respectively having different liquid jetting energy from each other; selecting at least one drive signal within a single jetting cycle of the jetting head; and applying the selected drive signal to the piezoelectric vibrators (FIG. 9).

Referring to claims 4, 9: wherein the selected drive signals are applied at different intervals within the single jetting cycle (FIG. 9)

Referring to claims 5, 10: wherein the intervals are determined such that a phase of residual vibration of a meniscus of the liquid in the nozzle orifice is adjusted due to jetting by a preceding drive signal (FIG. 4-7, and column 10, line 20-35).

Referring to claim 7: wherein the drive signal supplier selects at least two drive signals from the plural drive signals (FIG. 9).

2. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahara et al. (EP0827838) in view of Barbehenn et al. (U.S. 5363134) and Takahiro et al. (JP 11058704) as applied to claim 8, and further in view of Bain (U.S. 4521786).

Kitahara et al., as modified, disclose the claimed invention as discussed above, except wherein a plurality of drive signal generators are provided such that different drive signals are generated from the respective drive signal generator.

However, Bain discloses a printing system including a plurality of drive signal generators (in term of “programmable driver/control (PDC)”) (FIG. 4 and FIG. 5, element 113) are provided such that different drive signals are generated from the respective drive signal generator.

Art Unit: 2853

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to replace the drive signal generator in the liquid ejecting apparatus disclosed by Kitahara et al., as modified, by the plurality of drive signal generator for providing different drive signals as disclosed by Bain. The motivation of doing so is to be able to separately program the parameters such as velocity and volume of a droplet at each drive signal generator for each different nozzle orifice in order to obtain optimal operation of the printhead as taught by Bain (column 1, line 46-61).

Response to Arguments

Applicant's arguments with respect to claims 1, 3, 6, 8 have been considered but are moot in view of the new ground(s) of rejection.

Allowable Subject Matter

3. Claims 12 and 20 are allowed.

The most pertinent prior art fails to disclose wherein volume differences among the liquid droplets ejected by the respective drive signals can be divided by a volume of a liquid droplet which is the minimum volume jetted by one single drive signal. Therefore, the claimed invention is not disclosed by the cited prior arts.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S NGUYEN whose telephone number is (703)305-3342. The examiner can normally be reached on 7:00AM - 3:30PM.

Art Unit: 2853

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D MEIER can be reached on (703)308-4896. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

LN
January 30, 2004


HAI PHAM
PRIMARY EXAMINER